

Chemical Processing Competency 1.10

Competency 1.10 Chemical Processing personnel shall demonstrate a familiarity level knowledge of the requirements for using personal protective equipment (PPE).

1. Supporting Knowledge and Skills

- a. Describe the principles governing the selection, use and limitations of the following:
 - Respirators
 - Protective clothing
 - Hearing protection devices
- b. Describe the various types of personal equipment (devices or clothing) worn to protect a worker from chemical exposure, radiological exposure, and physical injury.

2. Self-Study Activities (corresponding to the intent of the above competency)

Below are two web sites containing many of the references you may need.

Web Sites		
Organization	Site Location	Notes
Department of Energy	http://wastenot.inel.gov/cted/stdguido.html	DOE Standards, Guides, and Orders
OSHA	http://www.osha-slc.gov/	OSHA documents and search engine
U.S. House of Representatives	http://law.house.gov/cfr.htm	Searchable Code of Federal Regulations

Read 29 CFR 1910 Subpart I, *Personal Protective Equipment*, and 29 CFR 1910.120 Appendix B, *General Description and Discussion of the Levels of Protection and Protective Gear*.

EXERCISE 1.10-A What are the two basic objectives of any personal protective equipment (PPE) program?

EXERCISE 1.10-B Referring to paragraph (a) of 29 CFR 1910 Subpart I, *Personal Protective Equipment*, when shall personal protective equipment be provided and used?

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EXERCISE 1.10-C Referring to 29 CFR 1910 Subpart I *Personal Protective Equipment*, and to 29 CFR 1910.120 Appendix B, *General Description and Discussion of the Levels of Protection and Protective Gear*, what are the areas of the human body that are afforded protection by personal protective equipment (PPE)?

Read Chapter 8, “Personal Protective Equipment (PPE),” of NIOSH/OSHA/USCG/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*

EXERCISE 1.10-D Referring to Chapter 8, “Personal Protective Equipment (PPE),” of NIOSH/OSHA/USCG/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, what are the primary and secondary considerations when selecting protective clothing?

EXERCISE 1.10-E Referring to Chapter 8, “Personal Protective Equipment (PPE),” of NIOSH/OSHA/USCG/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, describe the intended purpose of the personal protective equipment (PPE) listed in the following table:

Types and Purpose of Personal Protective Equipment (PPE)		
Body Part	PPE	Purpose
Eyes and face	Face shield	
	Splash hood	
	Safety glasses	
	Goggles	
	Sweat bands	
Respiratory	Self-contained breathing apparatus	
	Supplied-air respirators	
	Air-purifying respirators	

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Types and Purpose of Personal Protective Equipment (PPE)		
Body Part	PPE	Purpose
Hands and arms	Gloves and sleeves	
Feet	Safety boots	
	Disposable shoe or boot covers	
Head	Safety helmet	
	Hood	
	Protective hair covering	
Full body	Fully encapsulating suit	
	Nonencapsulating suit	
	Aprons, leggings, and sleeve protectors	

3. Summary

The control of occupational health hazards requires that an employee's exposure to harmful chemical agents, physical stresses, and physical agents does not exceed permissible levels. The variables or quantities of interest that must be measured are the concentration or intensity of the particular hazard and the duration of exposure.

The types of hazard control measures to be installed depend on the nature of the harmful substance or agent and its routes of entry or absorption into the body. An employee's exposure to an airborne substance is related to the amount of contaminants in the breathing zone and the time interval during which an employee is exposed to this concentration. Reducing the amount of contaminant in the employee's breathing zone or the amount of time that an employee spends in the area will reduce the overall exposure.

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Various methods of control available are broken down into these categories:

- *Engineering controls* that eliminate the hazard, either by initial design specifications or by applying methods of substitution, isolation, or ventilation.
- *Administrative controls* that restrict employees' exposures by scheduling reduced work times in contaminated areas, and by other work rules.
- *PPE* that should be considered a method of last resort when engineering controls are not sufficient to achieve acceptable limits of exposure. PPE can be used in conjunction with engineering and administrative controls, and with other methods.

The specific application of these controls, used according to the hazard involved, is dictated the Code of Federal Regulations.

4. Exercise Solutions

EXERCISE 1.10-A What are the two basic objectives of any personal protective equipment (PPE) program?

ANSWER 1.10-A

1. To protect the wearer from safety and health hazards.
2. To prevent injury to the wearer from incorrect use and/or malfunction.

EXERCISE 1.10-B Referring to paragraph (a) of 29 CFR 1910 Subpart I, *Personal Protective Equipment*, when shall personal protective equipment be provided and used?

ANSWER 1.10-B (Any reasonable paraphrase of the following:) "Whenever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation, or physical contact."

EXERCISE 1.10-C Referring to 29 CFR 1910 Subpart I *Personal Protective Equipment*, and to 29 CFR 1910.120 Appendix B, *General Description and Discussion of the Levels of Protection and Protective Gear*, what are the areas of the human body that are afforded protection by personal protective equipment (PPE)?

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- ANSWER 1.10-C
- Full body
 - Head
 - Eyes and face
 - Ears
 - Hands and arms
 - Feet
 - Respiratory system

EXERCISE 1.10-D Referring to Chapter 8, “Personal Protective Equipment (PPE),” of NIOSH/OSHA/USCG/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, what are the primary and secondary considerations when selecting protective clothing?

- ANSWER 1.10-D Primary:
- permeation
 - degradation
 - penetration
 - heat transfer

- Secondary:
- durability
 - flexibility
 - temperature effects
 - ease of decontamination
 - compatibility with other personal protective equipment
 - duration of use

EXERCISE 1.10-E Referring to Chapter 8, “Personal Protective Equipment (PPE),” of NIOSH/OSHA/USCG/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, in the following table complete the intended purpose of the listed types of personal protective equipment (PPE).

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ANSWER 1.10-E

Types and Purpose of Personal Protective Equipment (PPE)		
Body Part	PPE	Purpose
Eyes and face	Face shield	Protects against chemical splashes.
	Splash hood	Protects against chemical splashes.
	Safety glasses	Protect eyes against large particles and projectiles.
	Goggles	Can protect against vaporized chemicals, splashes, large particles, and projectiles.
	Sweat bands	Prevent sweat-induced eye irritation and vision impairment.
Respiratory	Self-contained breathing apparatus	Provides the highest available level of protection against airborne contaminants and oxygen deficiency.
	Supplied-air respirators	Protect against most airborne contaminants and permitted for use in oxygen-deficient atmospheres.
	Air-purifying respirators	Protect against specific chemicals and particulates up to specific concentrations.
Hands and arms	Gloves and sleeves	Protect hands and arms from chemical contact.
Feet	Safety boots	Protect feet from contact with chemicals and from compression, crushing, or puncture by falling, moving, or sharp objects.
	Disposable shoe or boot covers	Protect safety shoes or boots from contamination.

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Types and Purpose of Personal Protective Equipment (PPE)		
Body Part	PPE	Purpose
Head	Safety helmet	Protects head from blows.
	Hood	Protects against chemical splashes, particulates, and rain.
	Protective hair covering	Protects hair against chemical contamination, entanglement in machinery or equipment, or from interfering with vision and with the functioning of respiratory devices.
Full body	Fully encapsulating suit	Protects against splashes, dust, gases, and vapors.
	Nonencapsulating suit	Protects against splashes, dust, and other materials, but not against gases and vapors.
	Aprons, leggings, and sleeve protectors	Provide additional splash protection of chest, forearms, and legs.